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Columbasellus acheron, a new genus and species of subterranean isopod from Washington (Crustacea: Isopoda: Asellidae)

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Abstract.—*Columbasellus acheron*, new genus, new species, is described from a male specimen discovered during the cleaning of the municipal water well of Kalama, Washington. The genus *Columbasellus* is geographically closest to the genera *Caecidotea, Calasellus* and *Salmasellus,* but is morphologically more similar to the Eurasian *Asellus aquaticus/hilgendorfii* complex of species, with which it shares a male pleopod 2 that possesses a relatively large labial spur and basal spur, and fully formed, ovate exopods in pleopods 4 and 5. *Columbasellus acheron* inhabits the hyporheic zone of the Kalama River. Evidence is presented that indicates widespread use of stream gravel interstices by subterranean isopods in the Pacific Northwest, including the first record of *Salmasellus howarthi* from Oregon.

In the eastern United States there are about 65 described species of subterranean asellid isopods, mostly known from caves (Henry et al. 1986, Lewis & Bowman 1995), although a significant number have now been described that apparently live in soil or gravel interstices (Lewis 1982, 2000; Lewis & Bowman 1981; Lewis & Holsinger 1985). The situation is different west of the Rocky Mountains, where caves and karst are much less commonplace and only five subterranean asellids have been described: *Caecidotea sequoiae* Bowman, 1975, *Calasellus californicus* (Miller, 1933), *C. longus* Bowman, 1981, *Salmasellus steganothrix* Bowman, 1975 and *S. howarthi* Lewis, 2001.

It is becoming increasingly apparent that subterranean isopods are more widespread in western North America than the number of described species might indicate. We add to the growing body of evidence (Lewis 2001) that subterranean isopods are common in the hyporheic zone of western streams with the description of *Columbasellus acheron,* the first record of *Salmasellus howarthi* from Oregon, and several other records of undetermined eyeless, unpigmented isopods.

It is with some chagrin that we make this addition by describing a new genus and species of subterranean isopod that was discovered during the process of trying to eradicate it. The city of Kalama, Washington, currently obtains groundwater from sands and gravels below the Kalama River, which is located approximately 3.2 km east of the confluence of the Kalama and Columbia rivers near the Modrow Bridge (Fig. 1). The water withdrawal is accomplished via a Ranney well collection system that consists of three horizontal pipes extending below the Kalama River at a depth of five meters. The isopods were flushed from the municipal well during the process of cleaning it with superchlorination, scouring and vacuuming. Of dozens of isopods emerging from the well, only one was collected. This single specimen is recognized here as a unique subterranean isopod flushed from its hyporheic habitat.

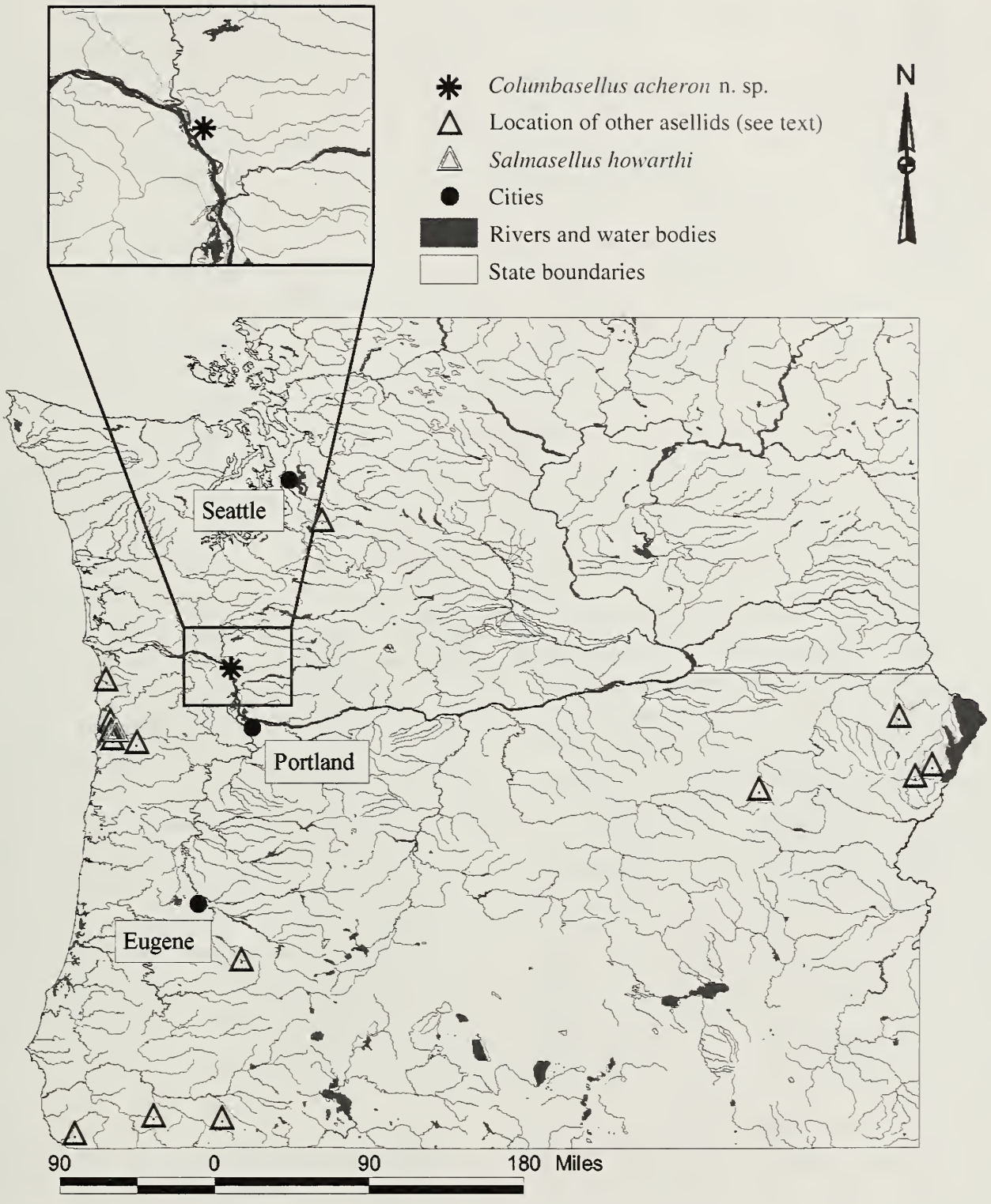

Fig. 1. Map of the Pacific northwest showing collection localities of subterranean asellid isopods.

Family Asellidae G. O. Sars, 1897
Columbasellus, new genus

Diagnosis.—Eyeless, unpigmented. Head without rostrum or lateral incisions. Mandible with 3-segmented palp, 4-cuspate incisors and lacinia mobilis. Maxilla 1 inner lobe with 5 apical setae. Pereopods, coxae visible in dorsal view; male pereopod 1 propodus slender, palm without processes; dactyls 1–7 with accessory unguis. Male pleopod 1 with retinacula present. Male pleopod 2 endopod with digitiform basal spur, endopodial groove originating from within basal part of endopod, labial spur present, cannula tapering to a subtriangular stylet; exopod with catch lobe. Pleopod 3 exopod with transverse suture. Pleo-

pods 4 and 5 with well formed ovate exopods and endopods.

Morphology and setation pattern of the mandible, maxilla 2, pereopods, uropods, essentially identical to other previously described asellids (e.g., see figures by Williams 1970, Bowman 1981).

Type-species.—Columbasellus acheron.

Etymology.—"Columb" from Columbia River + "*Asellus*".

Relationships.—Columbasellus is geographically closest to *Caecidotea* from U.S. Pacific coastal states (Williams 1970; Bowman 1974, 1975), *Calasellus* two species from California (Bowman 1981), and *Salmasellus* two species in Washington and Alberta (Bowman 1975, Lewis 2001). However, *Columbasellus* is morphologically more similar to the Eurasian *Asellus aquaticus/hilgendorfii* assemblage discussed by Henry and Magniez (1995). These authors analyzed the Pacific Rim asellids and found anatomical similarities that suggested a common ancestor for the following genera: *Asellus, Calasellus, Mesoasellus, Nipponasellus, Phreatoasellus, Sibirasellus,* and *Uenasellus.* These genera have the following characteristic states, which may be synapomorphic for the group: a first maxilla with 4 or 5 setae on the inner lobe; no processes on the palmar margin of the pereopod 1 propodite; a male second pleopod possessing an exopodite catch lobe, endopodite basal and labial spurs. *Mesoasellus, Phreatoasellus, Uenasellus, Calasellus* comprise a clade characterized by the following shared states: first maxilla with 5 setae on the inner lobe; mandibular palp of three articles. We add *Columbasellus* to this clade. Within the clade, *Columbasellus* is distinguished by the following autapomorphies: labial spur arising from within endopodial groove not from the rim of the endopodial groove as in *Calasellus* and *Sibirasellus*; cannula short and tapering, not elongate and seta-like as in *Calasellus.*

Columbasellus is separated from *Caecidotea* and *Salmasellus* by the absence of basal and labial spurs in the male second pleopod of the latter genera. Basal and labial spurs are present in *Columbasellus* and *Calasellus,* but the structure of the labial spurs are quite dissimilar. *Columbasellus* has a labial spur (see Henry & Magniez 1995) arising from within the endopodial groove, whereas the labial spur of *Calasellus* consists of a tiny cylindrical structure on the rim of the endopodial groove similar to that of *Sibirasellus.* The cannula in *Columbasellus* is a relatively short, tapering subtriangular stylet, while in *Calasellus* it is a seta-like filament that traverses most of the length of the endopod.

Bowman (1981) believed that *Calasellus* was related to *Asellus* (*Phreatoasellus*) Matsumoto, 1962 (five species in Japan, now elevated to generic status), which agrees with the later synthesis of Henry and Magniez (1995). *Columbasellus* and *Calasellus* are separated from *Phreatoasellus* by the dissimilar male pleopod 2 and by the absence of an accessory unguis on the pereopod dactyls. The pleopod 4 exopod of *Phreatoasellus* is ovate in *P. higoensis* and *P. kawamurai,* while pyriform in *P. uenoi, P. iriei* and *P. minatoi* (Matsumoto 1960, 1962, 1978). The pleopod 5 exopod is well developed in all *Phreatoasellus. Columbasellus* is further separated from *Calasellus* by the oval pleopod 4 exopod (pyriform in *Calasellus*) and by the presence of a well formed pleopod 5 exopod (rudimentary or absent in *Calasellus*).

Columbasellus acheron, new species
Figs. 2–4

Material examined.—Washington, Cowlitz Co., Kalama, Ranney Well (approximately 46.00N, 122.82W), about 5 m below Kalama River, collected May 2000, Carl McCrary, 1 male. This 14.5 mm male is the holotype and has been deposited in the collection of the Natural History Museum of Los Angeles County (LACM CR 2000-013.1).

Etymology.—Refers to the River Acher-

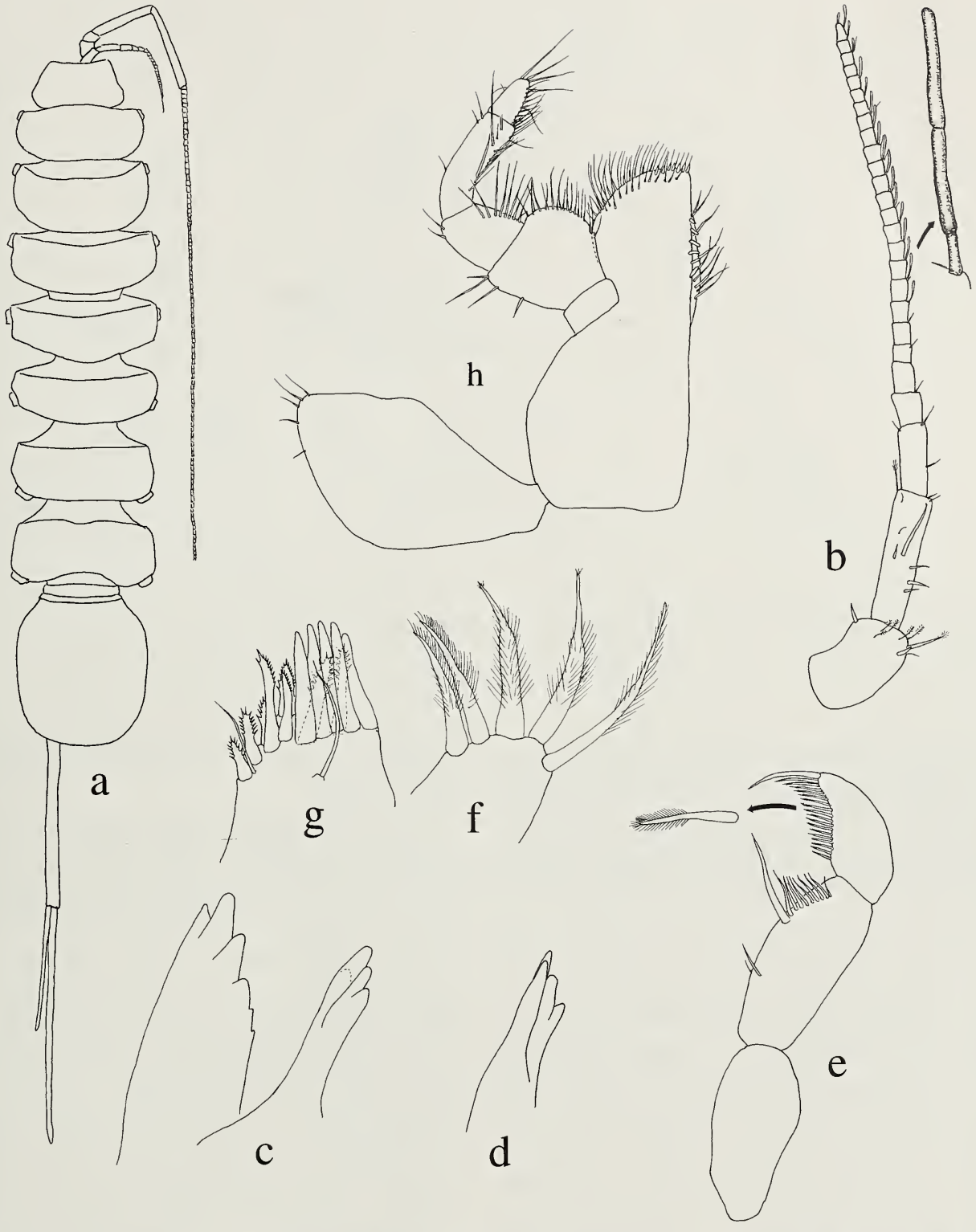

Fig. 2. *Columbasellus acheron*, holotype male. a, habitus; b, antenna 1; c, left mandible, incisor and lacinia mobilis; d, right mandibular incisor; e, mandibular palp; f, maxilla 1, inner lobe; g, same, outer lobe; h, maxilliped.

on of Greek mythology, one of the rivers flowing through the underworld.

Description.—Body linear, about 4.8× as long as wide. Head trapezoidal, about 2× as wide as long, anterior margin slightly concave, postmandibular lobes weakly developed. Pleotelson ovate, about 1.3× as long as wide, false sutures faintly visible on anterior dorsal surface, caudomedial lobe not produced.

Antenna 1 reaching to mid-length of last article of antenna 2 peduncle, flagellum of

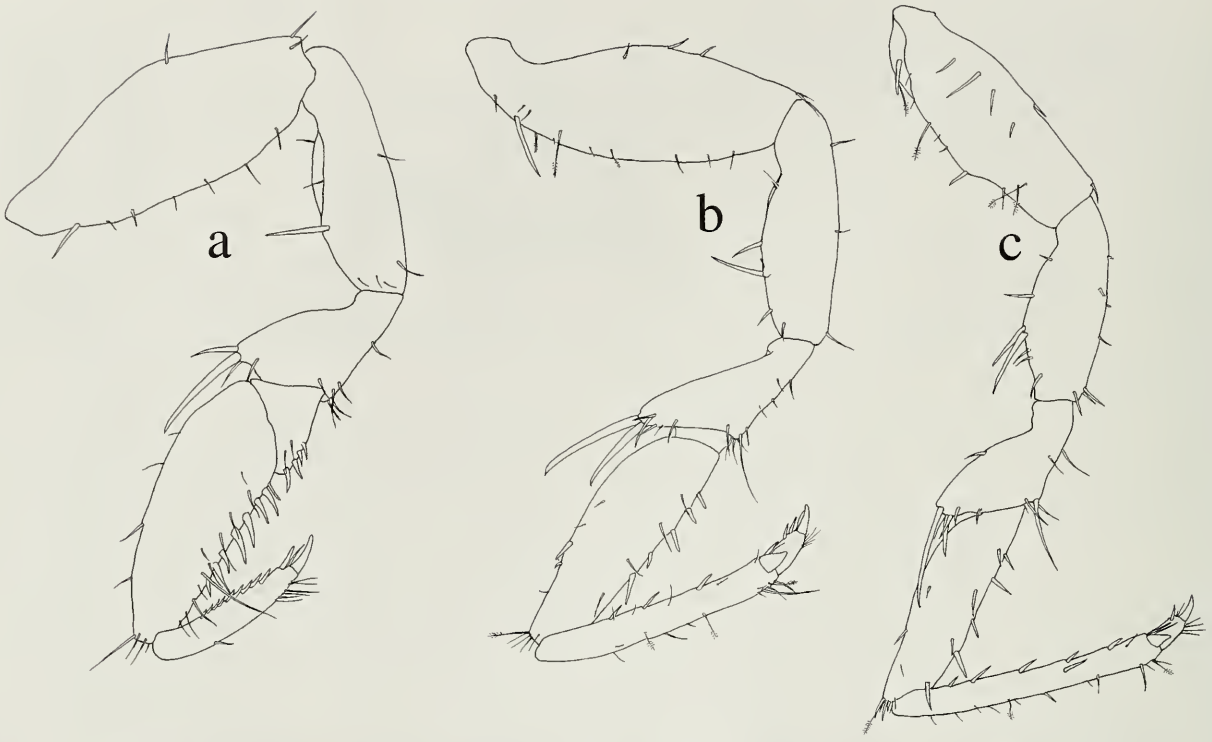

Fig. 3. *Columbasellus acheron,* holotype male. a, pereopod 1; b, pereopod 2; c, pereopod 7.

23 articles, esthete formula equivocal due to damage, apparently 3-0-1-0-12. Antenna 2 about 0.8× body length, basal segments slender, linear, cylindrical, specialized modifications absent, flagellum of about 67 articles.

Left mandible with incisor 4-cuspate and 2 minute denticles, lacinia mobilis 4-cuspate, 16 spine-like setae in adjacent row; right incisor 4-cuspate, 17 spine-like setae in row; molars present, unremarkable; palp with rows of plumose setae on articles 2 and 3. Maxilla 1, outer lobe with 13 robust apical spine-like setae and 1 seta, 1 subterminal plumose seta and 1 plumose seta along distal shaft, lateral margins with setules and minute comb spines; inner lobe with 5 stout plumose setae. Maxilla 2 with rows of setae on apical margins, unremarkable. Maxilliped with rows of stout plumose setae and 6 retinacula.

Pereopod 1, propodus about 2.8× as long as wide, palmar margin straight, with 8 spine-like setae, dactyl flexor margin with accessory unguis and 9 spine-like setae. Some pereopods missing or detached from holotype, but dactyls apparently all with accessory unguis.

Pleopod 1 longer than pleopod 2; protopod with 3 retinacula surrounded by minute comb spines; endopod subrectangular, about 2× length of protopod, setae of decreasing length along concave lateral margin, with 8 plumose setae along distolateral margin. Pleopod 2 protopod slightly longer than wide, mesial surface with numerous rows of minute comb spines; exopod proximal segment with 3 lateral plumose setae, distal segment with 20 plumose setae along margins, catch lobe present; endopod, digitiform basal spur present, mostly obscured in dorsal view; endopod produced into a tapering cylindrical process, curving distolaterally; endopodial groove prominent, traversing over half of endopod; labial spur originating from endopodial groove, extending along axis of groove; cannula extending into a robust, tapering stylet. Pleopod 3 exopod with 8 small, non-plumose setae along distal margin. Pleopod 4 exopod with 1 proximolateral seta and brush border

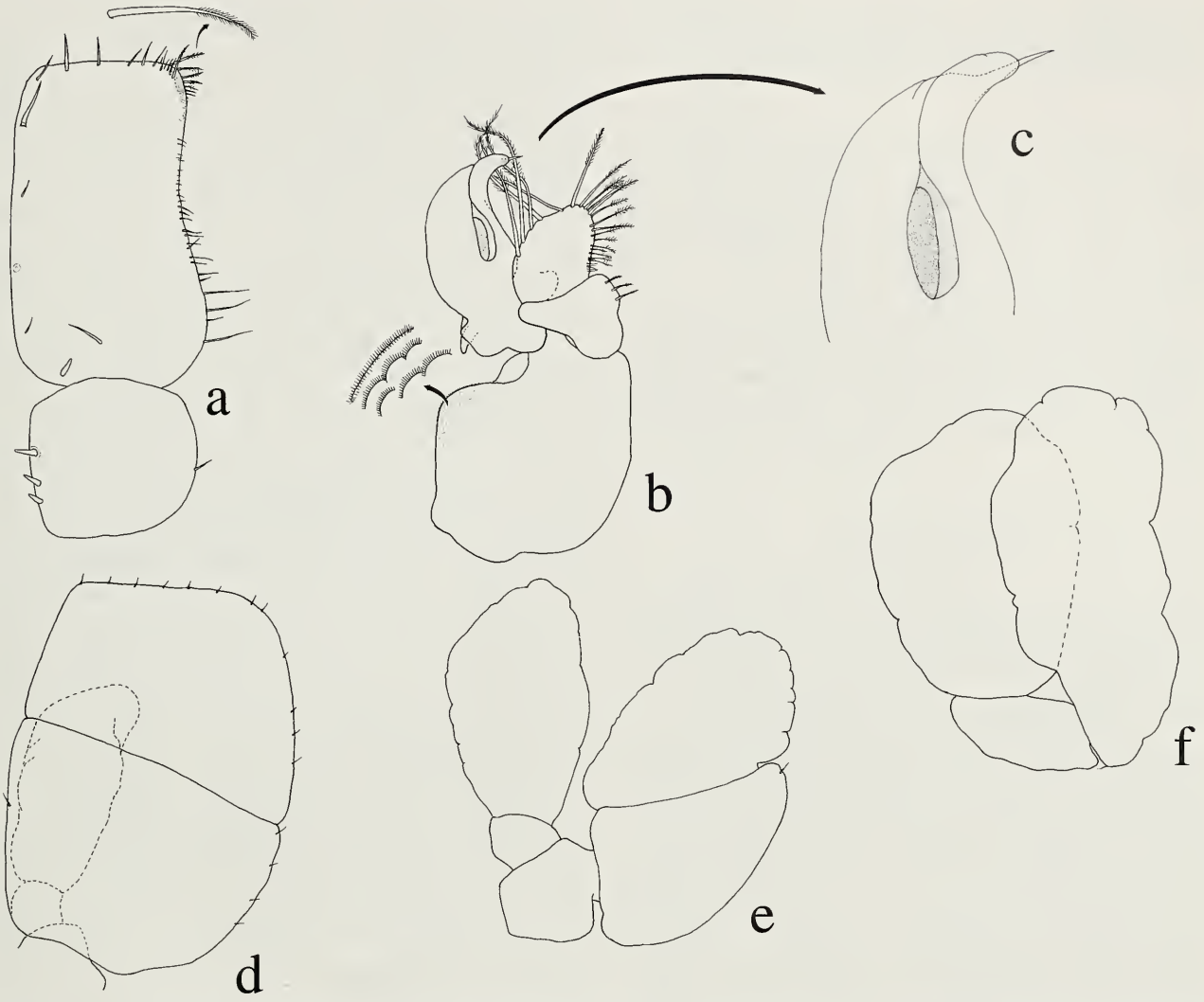

Fig. 4. *Columbasellus acheron,* holotype male. a, pleopod 1; b, pleopod 2; c, same, endopod tip; d, pleopod 3; e, pleopod 4; f, pleopod 5.

of setules, transverse suture present. Pleopod 5 endopod and exopod subequal.

Uropods cylindrical, linear, about 0.6× body length, 2.3× length of pleotelson; protopod about 0.7× length of endopod, endopod 1.9× length of exopod.

Vernacular name.—Columbia groundwater isopod.

Range.—This species is known only from the Kalama River at Kalama, in southwestern Washington, just above its confluence with the Columbia River, approximately 55 km NNW of Portland, Oregon (Fig. 1).

Notes on ecology.—The well from which *Columbasellus acheron* emerged consists of a large diameter concrete caisson that extends approximately 8 meters below grade, with three perforated lateral pipes that extend horizontally approximately 5 meters below the bottom of the Kalama River. The isopods surfaced following superchlorination and high pressure scouring of the lateral pipes. Most of the isopods settled to the bottom of the caisson and were later removed during vacuuming of the well by the contractor hired to conduct the cleaning. Although no additional isopods have been noted, the well is likely a window into the hyporheic habitat. Techniques that penetrate this environment (Pospisil 1992), e.g., Karaman-Chappuis for shallow stream gravel interstices or Bou-Rouch sampling of deeper gravels with pump wells, should allow access to the isopods. It is likely that other subterranean invertebrates (amphipods,

bathynellids, etc.) occur with *Columbasellus acheron* and await discovery.

Salmasellus howarthi Lewis, 2001

Material examined.—Oregon: Tillamook Co., Kilchis River drainage, Tilden Creek, 27 Sep 1998, 1 juvenile male.

This species was previously known only from two lava tube cave streams in southwestern Washington. This record extends the range approximately 100 km to the west.

Asellid species

Material examined.—Oregon: Clatsop Co., Sheewash Creek, 24 Aug 1994; Curry Co., Quail Prairie Creek near mouth, Oct 1992; Josephine Co., Howard Creek at mouth, 12 Oct 1997; Jackson Co., Crooked Creek, 13 Oct 1997; Lane Co., Cedar Creek, 25 Sep 1999; Tillamook Co., Clear Creek at mouth, 29 Sep 1998; East Foley Creek at river mile 2.5, 31 Aug 1994; Fall Creek, 29 Aug 1996; tributary to North Fork Kilchis River, 28 Sep 1997; Tilden Creek, 27 Sep 1998; Union Co., Limber Jim Creek at USFS Road 100, 20 Sep 1994; Wallowa Co., Chesnimnus Creek, 28 Aug 1991; Grouse Creek, 25 Aug 1992; Lick Creek, Aug 1992.—Washington: King Co., Lower Rock Creek, 15 Aug 1997; same locality, 1 Oct 1998.

This material consists of unidentifiable juveniles and females of subterranean species collected from stream gravels and presumably represents populations of *Calasellus, Salmasellus* or *Columbasellus.* The collection data are mapped to further illustrate the occurrence of subterranean asellids in the streams of Oregon and Washington (Fig. 1).

Acknowledgments

We sincerely thank Mr. Carl McCrary, Kalama Public Works Director, for collecting this unique isopod, who later gave it to Dr. John T. Longino, Evergreen State College, Olympia, Washington. Dr. Longino recognized the unusual nature of the specimen and transferred it to us for identification. We also thank Jude Van Buren (State of Washington Department of Health) and Richard Hoey (Regional Engineer, Southwest Drinking Water Operations) for information on the collection of the isopod. The new records of other asellids from Oregon and Washington are courtesy of Dr. Robert Wisseman, President, Aquatic Biology Associates, Corvallis, Oregon. We thank David L. White (University of South Carolina) for his help in preparing the map. We would also like to thank Dr. John R. Holsinger and Dr. Brian Kensley for reading the manuscript and making suggestions for its improvement. We also thank Dr. Guy Magniez, who not only read the manuscript, but worked with us on understanding the homologies of the Pacific Rim asellids.

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